

REMARKS

Claims 1, 3, and 5 -10 are presently pending in the application.

Claim 4, which was identical to claim 3, has been canceled. No new matter has been added by this amendment, and entry is respectfully requested. Further, in view of this amendment, withdrawal of the objection to claims 3 and 4 is respectfully requested.

Rejection Under § 103(a) Based on Steinmann in view of WO '101

The Examiner has again rejected claims 1 and 3-10 under 35 U.S.C. § 103(a) as being obvious over U.S. Patent Application Publication No. 2004/0137368 of Steinmann ("Steinmann") in view of WO 02/48101 ("WO '101"), relying on U.S. Patent Application Publication No. 2004/0030158 as an English equivalent. The Examiner maintains that Steinmann discloses a radiation-curable composition, useful for the production of three dimensional articles by stereolithography, which comprises: (A) at least one cationically polymerizing organic substance; (B) at least one free-radical polymerizing organic substance; (C) at least one cationic polymerization initiator; and (D) at least one free radical polymerization initiator. Steinmann allegedly discloses that the cationic polymerization initiator may be UVI 6974 from Union Carbide, which the Examiner contends contains (4-phenylthiophenyl)diphenylsulfonium hexafluoroantimonate, allegedly the claimed compound of formula (I) when M is antimony. The Examiner acknowledges that Steinmann does not teach that a sulfonium salt of formula (1) of purity 99% or higher and containing less than 3% by mass of a compound represented by formula (2) as claimed is used as a cationic polymerization initiator in the radiation-curable composition for stereolithography.

However, the Examiner takes the position that WO '101 teaches a method of manufacturing sulfonium salts used as photocationic polymerization initiators for resists. The Examiner points to Examples 1-3 of WO '101 as describing the synthesis of (4-phenylthiophenyl)diphenylsulfonium hexafluorophosphate with a purity of 99%. The Examiner also takes the position that this compound is also synthesized in Example 5 of WO '101. The Examiner argues that WO '101 discloses that the NMR and IR analyses indicated that small amounts of raw material are contained in the (4-phenylthiophenyl)diphenylsulfonium

hexafluorophosphate when the raw materials are diphenyl sulfoxide, diphenyl sulfide, potassium hexafluoroantimonate, acetonitrile, and acetic anhydride. Thus, the Examiner concludes that no compound represented by the claimed formula (II) is present in the compounds of WO '101. The Examiner further concludes that it would have been obvious to one having ordinary skill in the art at the time of the invention to use the (4-phenylthiophenyl)diphenylsulfonium hexafluorophosphate with a purity of 99% obtained in the process of WO '101 as a photocationic polymerization initiator in the composition of Steinman since WO '101 specifically indicates this use for the high-purity sulfonium salts. Finally, the Examiner argues that the elements of the dependent claims are taught by the proposed combination of Steinman and WO '101, and concludes that all of the pending claims are obvious over the proposed combination of references. Applicants respectfully traverse this rejection as follows.

As previously explained on the record, the claimed actinic radiation-curable resin composition for stereolithography includes a cationic polymerizable organic compound, a radical polymerizable organic compound, a photo initiator for radical polymerization and a photo initiator for cationic polymerization which contains a highly pure (97 weight % or higher) compound represented by formula (I) and less than 3% by mass of a compound represented by formula (II). This compound is highly pure to improve the aging stability during operation and the storage stability of the composition. Applicants have determined that the stability of the composition may be dramatically improved by increasing the ratio of compound having formula (I) to compound having formula (II), that is, preferably substantially excluding compounds of formula (II).

Steinmann teaches a radiation-curable composition which may contain UVI 6974 as a preferred cationic polymerization initiator (Steinmann paragraph [0076]). As demonstrated previously on the record, Applicants have empirically determined that the purity of the sulfonium compound of Formula (I) in UVI 6974 is at most 50%. It may be seen by comparing the compounds represented by formulas (I) and (II) that the compound represented by formula (II) has superior performance as a photo initiator (e.g., reactivity) since it is bifunctional. Accordingly, if one skilled in the art wanted to improve the purity of one of the compounds of Formula (I) and (II), he would attempt to improve the purity of the formula (II) compound, that is, the compound with superior reactivity. In other words, one skilled in the art who was looking

to modify the method of Steinmann would not have been motivated to improve the purity of the formula (I) compound, as suggested by the Examiner (such as by utilizing the compound of WO '101), but rather would have been motivated to improve the purity of the formula (II) compound. Therefore, the proposed combination of Steinmann with WO '101 is not proper.

Additionally, although WO '101 indeed discloses a highly pure sulfonium salt represented by formula (I), the object of WO '101 is to provide a method for manufacturing high-purity sulfonium salts in good yield. WO '101 does not teach or suggest the long-term storage stability of a resin composition for stereolithography. Accordingly, one skilled in the art would not have expected from WO '101 that the compound represented by formula (I) has advantageous effects on the long-term storage stability of resin compositions for stereolithography. That is, the results exhibit by the presently claimed invention would not have been expected based on the proposed combination of Steinmann and WO '101.

In conclusion, although WO '101 discloses a highly-pure compound represented by formula (I), it would not have been obvious for one having ordinary skill in the art at the time of the invention to have used the compound of WO '101 in the resin composition of Steinman for stereolithography in order to improve long-term storage stability of the resin composition, nor would the results exhibited by the presently claimed composition have been expected. Accordingly, the present claims would not have been obvious based on the proposed combination of Steinman and WO '101, and reconsideration and withdrawal of the §103(a) rejection are respectfully requested.

In view of the preceding Amendments and Remarks, it is respectfully submitted that the pending claims are patentably distinct from the prior art of record and in condition for allowance. A Notice of Allowance is respectfully requested.

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Respectfully submitted,
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Enclosures: Request for Continued Examination (RCE)
Petition for Extension of Time (two-months)